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AN EXPERIENCE WITH A BROKEN 24-INCH WATER MAIN[1]

By S. L. Etnyre[2]

Before describing a recent experience with the blowing out of a 24-inch main, its history and importance in the operation of the plant must be explained. This main was laid on Broadway in 1882, running from the Broadway pumping station at 37th Street to 21st Street, a distance of 8500 feet; from this point to 8th Street there is 5323 feet of 20-inch, thence to the high level storage reservoirs 5200 feet of 16-inch. Up to 1915 all the water for the city was supplied through this 24-inch pipe. On account of the importance of this main and owing to the fact that with increased consumption the pressure materially increased, it was found necessary to lay an auxiliary 16-inch main from the Broadway station to 21st Street, and this was completed in 1915. With the reservoirs' storage it was calculated that the 16-inch would supply the city in the case of any mishap to the 24-inch. Two 24-inch valves were cut in the Broadway main and a drain laid into the sewer from the main at its lowest point.

In 1884 the Broadway main broke at 30th Street, a section 12 by 24 inches blowing out at the bottom. No flaws were noticeable. In 1908 this main broke at 28th Street; a triangular section 18 inches at the base and 6 feet long blew out at the side. No flaws were noticeable. In 1909 on the west side of 34th Street the pipe broke as if pulled apart. No flaws were noticeable.

The normal pressure carried by this pipe was 105 pounds. On October 6, the last break took place on the east side of 34th Street, a 12-foot section splitting on its side its entire length. The pressure chart taken at the pumping station shows that the pressure dropped suddenly from 125 to 17 pounds. The volume of water escaping through this break was enormous, resulting in the drop of pressure all over the city; and many parts, even at moderate elevations, were without water until the valves were closed. From measurements taken at the high-level reservoir, making allowance for the normal city consumption, over 1,000,000 gallons had run out through this break. Fortunately, however, there was no material damage to private property.

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[1] Read before the Iowa Section, October 23, 1919. Discussion of this paper is requested and should be sent to the Editor.

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The chart also plainly shows the time of closing the valves. Some time was lost in this work by the breaking of a 24-inch valve stem. Pumping to the city through the 16-inch main was started immediately upon the closing of the valves. The drain valves into the sewer were then opened, and when the pipe was broken into it was found to be entirely free of water. It is also remarkable that all valves proved to be water-tight. The defective section was broken up with sledges, and replaced with a new length and the main ready for service within fifteen hours from the closing of the valves. During the time the repairs were being made less than 1 per cent of the consumers of the city were without water, and but for the breaking of the valve stem above referred to less than one-half of 1 per cent would have been without water.

An examination of the pipe along the line of fracture showed that the original coating was well preserved and that at one point there was a casting defect. A careful examination of the fracture, however, does not warrant the assumption that this condition prevailed to any extent. The thickness of the shell along this line was a good average with the rest of the pipe, being approximately 1-inch. The question that now naturally suggests itself is, "What is the reason for this break?" Of course, the water pressure was partly responsible, but it is not the complete answer. The pressure chart shows that it was not caused by "water hammer." The thickness of the shell seems adequate for the pressure it has to carry; it is a good grade of metal and there are no evidences of serious flaws on the fracture line or elsewhere when broken into small pieces.